

# PATENT ABSTRACTS OF JAPAN

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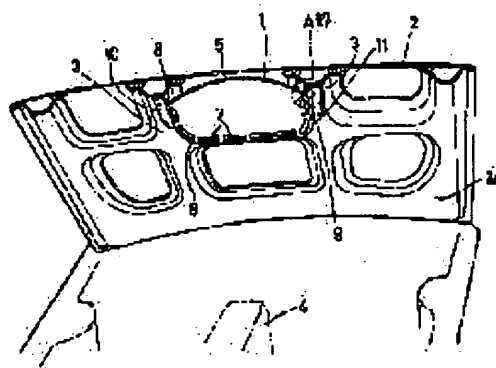
(21)Application number : **03-308181** (71)Applicant : **NISSAN MOTOR CO LTD**  
 (22)Date of filing : **25.11.1991** (72)Inventor : **YOSHIOKA MASANOBU**

## (54) HOOD IMPACT ABSORBING DEVICE

### (57)Abstract:

**PURPOSE:** To improve the protecting performance for a pedestrian by forming a flat characteristic of the hood reaction force characteristic in the interference with the head part of the pedestrian.

**CONSTITUTION:** An energy absorbing body 1 which possesses the characteristic for the pressure destruction shift having a peak is installed at the part where a rib 3 does not exist between the ribs 3 and 3 on the reverse surface 2a of a hood outer plate 2 and the part where the clearance from the built-in article 4 in an engine room is little. The energy absorbing body 1 has a shallow dome 5 shape which is formed by bulging up a thin plate so that the center part forms a hill, and a number of first row holes 7 are formed along the outer periphery 6 of the dome 5. The outer periphery of the first row hole 7 is turned back in the reverse direction to the dome 5, and a deformation part 8 is formed, and a number of second row holes 9 are formed in the deformation part 8. Further, the turned-back outer peripheral edge part 10 is joined with the rib 3 through the sport welding.



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CLAIMS

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[Claim(s)]

[Claim 1] collision collapse -- setting -- collapse -- the hood impact absorber characterized by for the property of reaction force over a variation rate having arranged in the background of a hood the energy-absorbing object which has the peak of a lot, having compensated the low reaction force field of a hood shell plate with the absorber of said energy, and making a total reaction force property a flat property.

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DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[Industrial Application] This invention relates to the hood impact absorber aiming at pedestrian protection.

[0002]

[Description of the Prior Art] There is a thing as shown in drawing 13 as a conventional hood impact absorber (for example, there are JP,61-67265,U, JP,61-26682,U, etc. as similar invention).

[0003] That is, equipment has joined the impact absorber 102 of a cross-section the configuration of U characters to the A-A cross-section location of the rear face of the hood 101 illustrated to drawing 14 with adhesives 103 conventionally [ this ].

[0004] If a pedestrian interferes in the top face of a hood 101, the field of a hood 101 will be suppressed below and the pressure welding of the energy absorber 102 will be carried out to the built-in object 104 of an engine room. The energy-absorbing object 102 which carried out the pressure welding is caught in the height 105 prepared in the pressure-welding section of the built-in object 104, it is crushed, without sideslipping, and absorbs striking energy.

[0005]

[Problem(s) to be Solved by the Invention] However, if it is in such a conventional hood impact absorber, since the cross section is carrying out the U character configuration and has joined the ends to the background of a hood with adhesives, when a energy-absorbing object is suppressed, it has the structure where the building envelope of a cross-section the configuration of U characters is narrowed.

[0006] therefore, it is shown in drawing 15 -- as -- the reaction force of a energy-absorbing object -- compression -- a variation rate -- it is in the inclination to go up with the increment in an amount, and becomes large especially the second half. Moreover, in early stages of compression, reaction force descends rapidly in riser medium, and the reaction force mode of a hood shell plate has it in the inclination to go up again in the second half. For this reason, since total reaction force descends in medium and turns into high reaction force in the second half, in order to enlarge the amount of energy-absorbing, there was a trouble that big space was required.

[0007] This invention is made paying attention to such a conventional trouble, and aims at offering the hood impact absorber made into the energy-absorbing property [ flat small and ].

[0008]

[Means for Solving the Problem] for this reason, this invention -- collision collapse -- setting -- collapse -- the property of reaction force over a variation rate arranged in the background of a hood the energy-absorbing object which has the peak of a lot, and made the flat property the total reaction force property without \*\* with said energy-absorbing object for the low reaction force field of a hood shell plate.

[0009]

[Function] If a pedestrian head interferes in a hood top face, a hood shell plate will deform and will compress a energy-absorbing object in compression-set medium.

[0010] On the other hand, reaction force is rapidly improved in early stages of compression, and the reaction force mode of a hood shell plate descends in medium, and is in the inclination to go up again at an anaphase. This middle low reaction force field serves as a \*\*\*\* crack and a energy-absorbing property [ flat / as total ] with the energy-absorbing object which has the peak of a lot.

[0011]

[Example] Hereafter, this invention is explained based on a drawing. Drawing 1 R> 1 - drawing 3 are drawings showing one example of this invention, and the sectional view of the drawing 1 cutting plane and drawing 3 of the perspective view and drawing 2 which show the cross section where drawing 1 cut the hood center section right and left are the enlarged drawings of the drawing 1 A section.

[0012] A configuration is explained first. The energy absorber 1 is a part without the rib 3 of hood shell plate 2 rear-face 2a, and the rib 3 between three, and path clearance with the object 4 with a built-in engine room is attached in few parts.

[0013] The energy-absorbing object 1 is carrying out dome 5 shallow configuration which heaped up sheet metal so that a center section might become a hill, and the hole 7 of many 1st train is formed along with the periphery section 6 of a dome 5. The periphery of the hole 7 of this 1st train is turned up by a dome 5 and hard flow, and forms the variant part 8, and the hole 9 of many 2nd train is established in the variant part 8. And the periphery edge 10 turned up further has joined to the rib 3 by spot welding 11.

[0014] Next, an operation is explained with reference to drawing 4 - drawing 7 . If a pedestrian collides with a car and a head 12 interferes in the top face of the hood shell plate 2 as illustrated to drawing 4 , the hood shell plate 2 which is rising in the center section is pressed, and tends to become flat. At this time, the hood shell plate 2 tends to spread outside and the surroundings of an interfering point with the pedestrian head 12 rise.

[0015] And as shown in drawing 7 , in these early stages of compression, the hood shell plate 2 generates big reaction force.

[0016] Furthermore, as compression of the hood shell plate 2 advances and it is shown in drawing 5 R> 5, when it begins to dent the hood shell plate 2 below, it becomes the direction where the stress of the circumference of an interfering point with the pedestrian head 12 is eased, and as for the reaction force of the hood shell plate 2, a drop inclination is shown as shown in drawing 7 . On the other hand, since it interferes in the summit section of the dome 5 of the energy-absorbing object 1, and a dome 5 is pushed below, the periphery spreads outside and the hood shell plate 2 is deformed plastically to a flat configuration, the energy-absorbing object 1 generates the big reaction force of a lot.

[0017] The reaction force lowering in the drop inclination of the hood shell plate 2 is compensated according to the reaction force of this energy-absorbing object 1.

[0018] Furthermore, if lower part migration of the hood shell plate 2 progresses, as are shown in drawing 6 R> 6, and the hood shell plate 2 is strongly pulled in the direction of an interfering point with the pedestrian head 12 and is shown in drawing 7 , the hood shell plate 2 will generate again high reaction force. On the other hand, the energy-absorbing object 1 deforms evenly and shifts to a non-reaction force condition.

[0019] Thus, since the reaction force of the energy-absorbing object 1 is made to act on the hood shell plate 2 when the hood shell plate 2 causes reaction force lowering, the total reaction force exerted on the pedestrian head 12 is kept almost constant as shown in drawing 7 . Therefore, the injury of the pedestrian at the time of the occurrence of accident is mitigated.

[0020] The 2nd example of this invention is shown in drawing 8 . This example forms in one the rib 13 which reinforces the hood shell plate 2, and the energy-absorbing object 14 as said 1st example with the same basic structure, and attaches them in the rear face of the hood shell plate 2.

[0021] According to this example, the same effectiveness as said 1st example is acquired, and moreover, since there are few components mark, it excels in the cost side and the production process side.

[0022] The 3rd example of this invention is shown in drawing 9 - drawing 10 . As shown in drawing 10 , this example forms the macroscelia 18 and crus breve incudis 19 which formed much horseshoe-shaped slitting 17 in the sheet metal 16 of one sheet, folded the inside part surrounded by this horseshoe-shaped slitting 17 in the one side side of sheet metal 16, and were stood a lifting, a right angle, or aslant ( drawing 9 and drawing 10 illustrate the case of being slanting), and constitutes the energy-absorbing object 15. And where path clearance 20 is secured for this energy-absorbing object 15 between the hood shell plates 2, the perimeter of sheet metal 16 is joined to the flange 21 fabricated to a rib 3 and one by spot welding 22, and it attaches in the hood shell plate 2.

[0023] What will break if fixed curvature is reached with griddles (S40C etc.) or plastic resin is used for the construction material of sheet metal 16. Moreover, the notching 23 prepared in the root section of the macroscelia 18 and the crus breve incudis 19 performs control of breakage reinforcement.

[0024] If a pedestrian's head interferes with the hood shell plate 2 and the hood shell plate 2 deforms, a load will act on the energy-absorbing object 15. Then, the macroscelia 18 and the crus breve incudis 19 do reaction force with deflection in the object 4 with a built-in engine room. And it will break, if the load to which the hood shell plate 2 deforms further, and acts on the macroscelia 18 and the crus breve incudis 19 exceeds a fixed load, and reaction force is lost, and the same reaction force property as said 1st example is demonstrated.

[0025] The 4th example of this invention is shown in drawing 11 - drawing 12 . This example joins the energy-absorbing object 25 of a pan form to one side of the sheet metal 24 joined to the flange of a rib 3 with spot welding 27 or adhesives.

[0026] Even if climax height (h) is large, in order to make it easy to transform in comparison, the hole 26 has opened the energy-absorbing object 25 of a pan form in the center section. Moreover, from the pan form energy-absorbing object 25, the spot welding section 27 projects, and is prepared through the fuze structured division 28, a pedestrian head interferes in the hood shell plate 2, a load acts on the pan form energy-absorbing object 25, and when the periphery of the pan form energy-absorbing object 25 spreads outside, the fuze structured division 28 goes out simply.

[0027] Since the same effectiveness as said example is acquired by this example and it moreover has the fuze structure 28 by it, the peak property of a lot can be acquired certainly.

[0028]

[Effect of the Invention] Since it is constituted as explained above, according to this invention, reaction force of a \*\*\*\*\* hood can be made into an almost flat property at a pedestrian.

Therefore, the injury of the pedestrian at the time of the occurrence of accident is mitigable.

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TECHNICAL FIELD

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PRIOR ART

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EFFECT OF THE INVENTION

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TECHNICAL PROBLEM

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MEANS

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**OPERATION**

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[0024] If a pedestrian's head interferes with the hood shell plate 2 and the hood shell plate 2 deforms, a load will act on the energy-absorbing object 15. Then, the macroscelia 18 and the crus breve incudis 19 do reaction force with deflection in the object 4 with a built-in engine room. And it will break, if the load to which the hood shell plate 2 deforms further, and acts on the macroscelia 18 and the crus breve incudis 19 exceeds a fixed load, and reaction force is lost, and the same reaction force property as said 1st example is demonstrated.

[0025] The 4th example of this invention is shown in drawing 11 - drawing 12 . This example joins the energy-absorbing object 25 of a pan form to one side of the sheet metal 24 joined to the flange of a rib 3 with spot welding 27 or adhesives.

[0026] Even if climax height (h) is large, in order to make it easy to transform in comparison, the hole 26 has opened the energy-absorbing object 25 of a pan form in the center section. Moreover, from the pan form energy-absorbing object 25, the spot welding section 27 projects, and is prepared through the fuze structured division 28, a pedestrian head interferes in the hood shell plate 2, a load acts on the pan form energy-absorbing object 25, and when the periphery of the pan form energy-absorbing object 25 spreads outside, the fuze structured division 28 goes out simply.

[0027] Since the same effectiveness as said example is acquired by this example and it moreover has the fuze structure 28 by it, the peak property of a lot can be acquired certainly.

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## DESCRIPTION OF DRAWINGS

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### [Brief Description of the Drawings]

[Drawing 1] The perspective view showing the condition of having cut the hood center section which shows the 1st example of this invention right and left.

[Drawing 2] The sectional view showing the cutting plane of drawing 1 .

[Drawing 3] The perspective view expanding and showing the A section of drawing 1 .

[Drawing 4] The sectional view which similarly explains the condition in early stages of [ hood compression ] the 1st example.

[Drawing 5] The sectional view which similarly explains the condition in the middle of [ hood compression ] the 1st example.

[Drawing 6] The sectional view which similarly explains the condition of the hood compression anaphase of the 1st example.

[Drawing 7] Drawing showing the relation of the hood compression stroke and reaction force of the 1st example similarly.

[Drawing 8] The sectional view showing the 2nd example of this invention.

[Drawing 9] The sectional view showing the 3rd example of this invention.

[Drawing 10] The perspective view showing the 3rd example similarly.

[Drawing 11] The sectional view showing the 4th example of this invention.

[Drawing 12] The perspective view showing the 4th example similarly.

[Drawing 13] The perspective view showing the conventional example.

[Drawing 14] The perspective view explaining the attaching position of a energy-absorbing object.

[Drawing 15] Drawing showing the relation between the conventional hood compression stroke and reaction force.

### [Description of Notations]

- 1 -- Energy-absorbing object
- 2 -- Hood shell plate
- 3 -- Rib
- 4 -- Object with a built-in engine room
- 5 -- Dome
- 7 -- Hole of the 1st train
- 8 -- Variant part
- 9 -- Hole of the 2nd train
- 12 -- Pedestrian head
- 14 -- Energy-absorbing object
- 15 -- Energy-absorbing object
- 16 -- Sheet metal
- 18 -- Macroscelia
- 19 -- Crus breve incudis

- 24 -- Sheet metal
- 25 -- Pan form energy-absorbing object
- 26 -- Hole
- 28 -- Fuse structured division

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[Translation done.]



(19) 日本国特許庁 (J P)

(12) 公開特許公報 (A)

(11) 特許出願公開番号

特開平5-139338

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(22) 出願日 平成3年(1991)11月25日

(71) 出願人 000003997

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(72) 発明者 ▲吉▼岡 政信

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自動車株式会社内

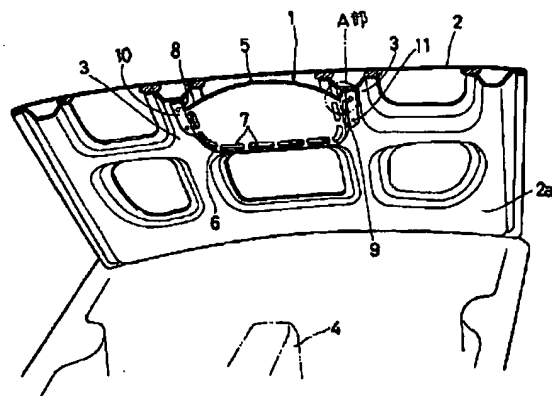
(74) 代理人 弁理士 志賀 富士弥 (外3名)

(54) 【発明の名称】 フード衝撃吸収装置

(57) 【要約】

【目的】 歩行者の頭部が干渉したときのフード反力特性をフラットな特性として、歩行者保護性能を向上する。

【構成】 圧壊変位に対する特性が一山のピークを有するエネルギー吸収体1がフード外板2裏面2aのリップ3、3間のリップ3が無い部分で、かつエンジンルーム内蔵物4とのクリアランスが少ない部分に取り付けられている。エネルギー吸収体1は、薄板を中央部が丘になるように盛り上げた浅いドーム5形状をしており、ドーム5の外周6に沿って多数の第1列の穴7が設けられている。第1列の穴7の外周はドーム5と逆方向に折り返されて変形部8を形成しており、変形部8に多数の第2列の穴9が設けられている。そして、更に折り返した外周端部10がリップ3にスポット溶接で接合している。



1-エネルギー吸収体  
2-フード外板  
4-エンジンルーム内蔵物

## 【特許請求の範囲】

【請求項1】 衝突圧壊において圧壊変位に対する反力の特性が一山のピークを有するエネルギー吸収体をフードの裏側に配設し、フード外板の低反力領域を前記エネルギーの吸収体によって補い、トータルの反力特性をフラットな特性としたことを特徴とするフード衝撃吸収装置。

## 【発明の詳細な説明】

【0001】

【産業上の利用分野】 本発明は、歩行者保護を目的としたフード衝撃吸収装置に関する。

【0002】

【従来の技術】 従来のフード衝撃吸収装置としては例えば、図13に示すようなものがある（例えば類似発明として実開昭61-67265号公報、実開昭61-26682号公報等がある）。

【0003】 すなわち、この従来装置は、図14に図示したフード101の裏面のA-A断面位置に断面U字形の衝撃吸収体102を接着剤103で接合している。

【0004】 フード101の上面に歩行者が干渉すると、フード101の面は下方へ圧迫され、エネルギー吸収体102はエンジンルームの内蔵物104に圧接する。圧接したエネルギー吸収体102は、内蔵物104の圧接部に設けられた突起部105に引掛かり、横滑りすることなく潰れて衝撃エネルギーを吸収するようになっている。

【0005】

【発明が解決しようとする課題】 しかしながら、このような従来のフード衝撃吸収装置にあっては、断面がU字形状をしており、その両端を接着剤でフードの裏側に接合しているため、エネルギー吸収体が圧迫されたとき、断面U字形の内部空間が狭められる構造となっている。

【0006】 従って、図15に示すようにエネルギー吸収体の反力は、圧縮変位量の増加とともに上昇する傾向にあり、特に後半で大きくなる。また、フード外板の反力モードは圧縮初期に反力が急激に上がり中間で降下し、後半で再び上昇する傾向にある。このため、トータル反力は中間で降下し後半で高い反力となるので、エネルギー吸収量を大きくするため、大きな空間が必要であるという問題点があった。

【0007】 本発明は、このような従来の問題点に着目してなされたものであり、小型でかつフラットなエネルギー吸収特性とした、フード衝撃吸収装置を提供することを目的としている。

【0008】

【課題を解決するための手段】 このため本発明は、衝突圧壊において圧壊変位に対する反力の特性が一山のピークを有するエネルギー吸収体をフードの裏側に配設し、フード外板の低反力領域を前記エネルギー吸収体によ

て補ない、トータルの反力特性をフラットな特性とした。

【0009】

【作用】 歩行者頭部がフード上面に干渉すると、フード外板は変形し、圧縮変形中間においてエネルギー吸収体を圧縮する。

【0010】 一方、フード外板の反力モードは、圧縮初期に反力が急激に上がり、中間で降下し、後期に再び上昇する傾向にある。この中間の低反力領域が、一山のピークを有するエネルギー吸収体で補われ、トータルとしてフラットなエネルギー吸収特性となる。

【0011】

【実施例】 以下、本発明を図面に基いて説明する。図1～図3は本発明の一実施例を示す図で、図1は、フード中央部を左右に切った断面を示す斜視図、図2は図1切断面の断面図、図3は図1A部の拡大図である。

【0012】 まず構成を説明する。エネルギー吸収体1がフード外板2裏面2aのリブ3、3間のリブ3が無い部分で、かつエンジンルーム内蔵物4とのクリアランスが小さい部分に取り付けられている。

【0013】 エネルギー吸収体1は、薄板を中央部が丘になるように盛り上げた浅いドーム5形状をしており、ドーム5の外周部6に沿って多数の第1列の穴7が設けられている。該第1列の穴7の外周はドーム5と逆方向に折り返されて変形部8を形成しており、変形部8に多数の第2列の穴9が設けられている。そして更に折り返した外周端部10がリブ3にスポット溶接11で接合している。

【0014】 次に作用を図4～図7を参照して説明する。図4に図示したように、歩行者が車両と衝突して頭部12がフード外板2の上面に干渉すると、中央部で盛り上っているフード外板2は、圧迫され平坦になろうとする。この時フード外板2は外側へ拡がろうとして歩行者頭部12との干渉点のまわりが盛り上がる。

【0015】 そして、図7に示すように、この圧縮初期においては、フード外板2は大きな反力を発生する。

【0016】 更に、フード外板2の圧縮が進行して、図5に示すように、フード外板2が下方へ凹み始めると、歩行者頭部12との干渉点まわりのストレスが緩和される方向となり、図7に示すようにフード外板2の反力は降下傾向を示す。一方、フード外板2はエネルギー吸収体1のドーム5の頂上部に干渉し、ドーム5が下方へ押され、その外周は外側へ拡がり平坦な形状へと塑性変形するので、エネルギー吸収体1は一山の大きな反力を発生する。

【0017】 このエネルギー吸収体1の反力によってフード外板2の降下傾向にある反力低下を補う。

【0018】 更にフード外板2の下方移動が進むと、図6に示すように、フード外板2は歩行者頭部12との干渉点方向へ強く引張られて、図7に示すように、フード

外板2は再び高い反力を発生する。一方、エネルギー吸収体1は平坦に変形して無反力状態へと移行する。

【0019】このように、フード外板2が反力低下を起こしたときに、エネルギー吸収体1の反力をフード外板2に作用させるので、歩行者頭部12に及ぼすトータル反力は図7に示すように、ほぼ一定に保たれる。従って、事故発生時の歩行者の傷害は軽減される。

【0020】図8には、本発明の第2実施例を示す。この実施例は、フード外板2を補強するリブ13と、基本構造が前記第1実施例と同じエネルギー吸収体14とを

【0021】本実施例によれば、前記第1実施例と同様の効果が得られ、しかも部品点数が少ないので、コスト面及び製造工程面で優れている。

【0022】図9～図10には、本発明の第3実施例を示す。この実施例は、図10に示すように、一枚の薄板16に多数のコの字状切り込み17を設け、該コの字状切り込み17に囲まれた内側部分を薄板16の片面側に折り起こし、直角または斜め(図9及び図10は斜めの場合を図示)に立てた長脚18及び短脚19を形成してエネルギー吸収体15を構成する。そして、該エネルギー吸収体15を、フード外板2との間に、クリアランス20を確保した状態で、薄板16の周囲をリブ3と一体に成形したフランジ21にスポット溶接22で接合しフード外板2に取り付けたものである。

【0023】薄板16の材質には、鉄板(S40C等)またはプラスチック樹脂等で一定の曲率に達すると折損するものが使用される。また折損強度のコントロールは長脚18及び短脚19の付け根部に設けた切欠23によって行う。

【0024】歩行者の頭部がフード外板2と干渉してフード外板2が変形するとエネルギー吸収体15に荷重が作用する。すると、長脚18及び短脚19はエンジンルーム内蔵物4に当たり曲がりながら反力を及ぼす。そして、フード外板2が更に変形して長脚18及び短脚19に作用する荷重が一定荷重を超えると折損して反力を失い、前記第1実施例と同様の反力特性を発揮する。

【0025】図11～図12には、本発明の第4実施例を示す。この実施例は、リブ3のフランジに接合した薄板24の片面に、皿形のエネルギー吸収体25をスポット溶接27又は接着剤で接合したものである。

【0026】皿形のエネルギー吸収体25は、盛り上がり高さ(h)が大きくても比較的に変形し易くするために、中央部に穴26が開けられている。また、スポット溶接部27は、皿形エネルギー吸収体25からフューズ構造部28を介して突出して設けられており、歩行者頭部がフード外板2に干渉し、皿形エネルギー吸収体25に荷重が作用して、皿形エネルギー吸収体25の外周が外側へ広がったとき簡単にフューズ構造部28が切れる

ようになっている。

【0027】本実施例によっても前記実施例と同様の効果が得られ、しかもフューズ構造28を有しているので、一山のピーク特性を確実に得ることができる。

【0028】

【発明の効果】以上説明してきたように構成されているので、本発明によれば、歩行者におよぼすフードの反力をほぼフラットな特性とすることができる。従って、事故発生時の歩行者の傷害を軽減することができる。

10 【図面の簡単な説明】

【図1】本発明の第1実施例を示すフード中央部を左右に切った状態を示す斜視図。

【図2】図1の切断面を示す断面図。

【図3】図1のA部を拡大して示す斜視図。

【図4】同じく第1実施例のフード圧縮初期の状態を説明する断面図。

【図5】同じく第1実施例のフード圧縮中期の状態を説明する断面図。

20 【図6】同じく第1実施例のフード圧縮後期の状態を説明する断面図。

【図7】同じく第1実施例のフード圧縮ストロークと反力との関係を示す図。

【図8】本発明の第2実施例を示す断面図。

【図9】本発明の第3実施例を示す断面図。

【図10】同じく第3実施例を示す斜視図。

【図11】本発明の第4実施例を示す断面図。

【図12】同じく第4実施例を示す斜視図。

【図13】従来例を示す斜視図。

30 【図14】エネルギー吸収体の取付位置を説明する斜視図。

【図15】従来のフード圧縮ストロークと反力との関係を示す図。

【符号の説明】

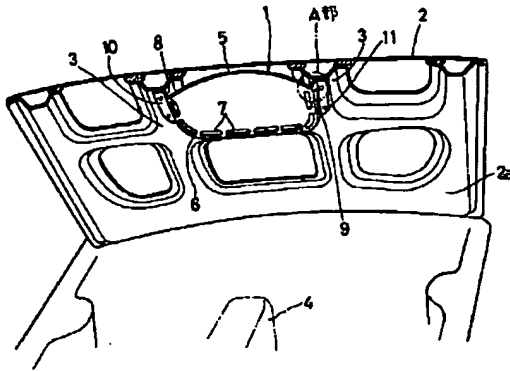
- 1…エネルギー吸収体
- 2…フード外板
- 3…リブ
- 4…エンジンルーム内蔵物
- 5…ドーム
- 7…第1列の穴
- 8…変形部
- 9…第2列の穴
- 12…歩行者頭部
- 14…エネルギー吸収体
- 15…エネルギー吸収体
- 16…薄板
- 18…長脚
- 19…短脚
- 24…薄板
- 25…皿形エネルギー吸収体
- 26…穴

5

6

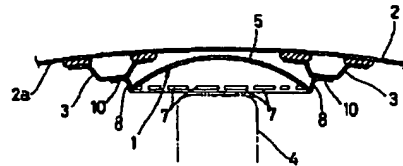
28…ヒューズ構造部

【図1】

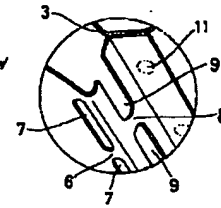


1—エネルギー吸収体  
2—フード外板  
4—エソフォルム内蔵物

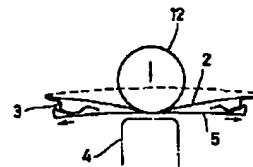
【図2】



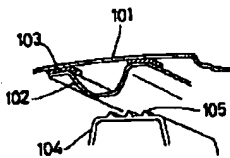
【図3】



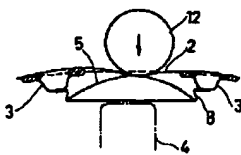
【図6】



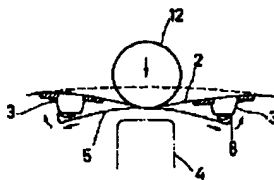
【図13】



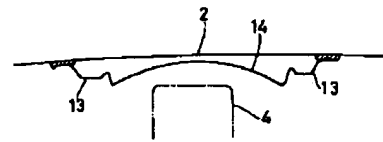
【図4】



【図5】

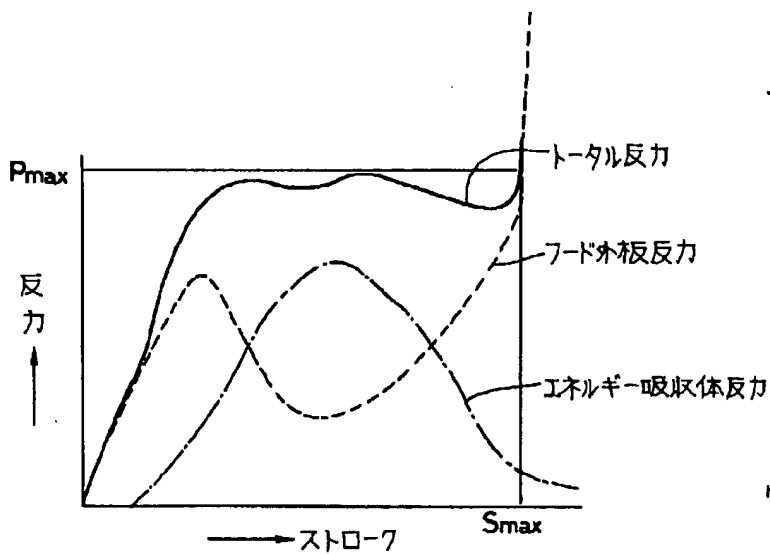


【図8】

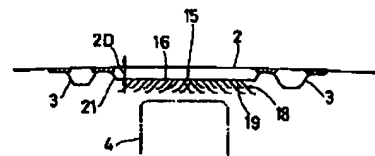


13—リブ  
14—エネルギー吸収体

【図7】

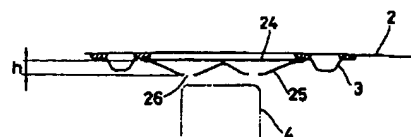


【図9】

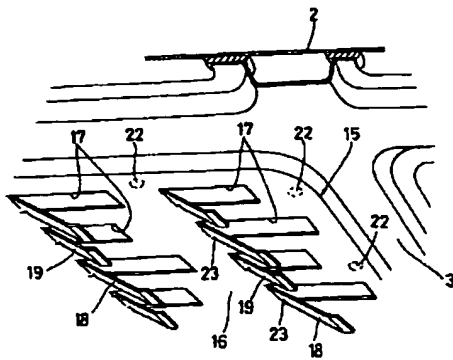


15—エネルギー吸収体  
18—足脚  
19—短脚

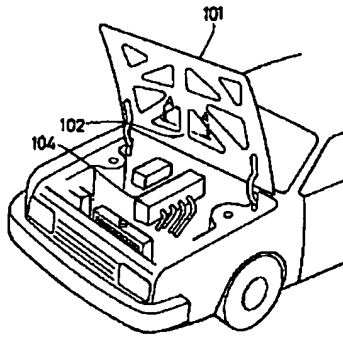
【図11】



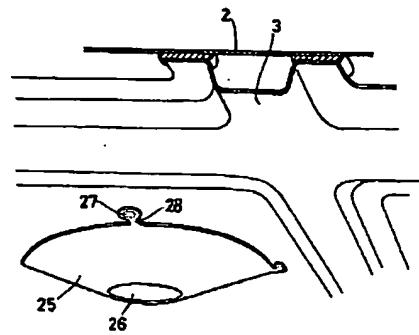
【図10】



【図14】



【図12】



25—皿形エネルギー吸収体

【図15】

